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Facilitating Decision-making, Re-use and Collaboration: A Knowledge Management Approach to Acquisition Program Self-awareness

Defense Acquisition in Transition

6TH ANNUAL ACQUISITION RESEARCH SYMPOSIUM

Facilitating Decision-Making, Re-use and Collaboration: A Knowledge Management Approach to Acquisition Program Self-Awareness

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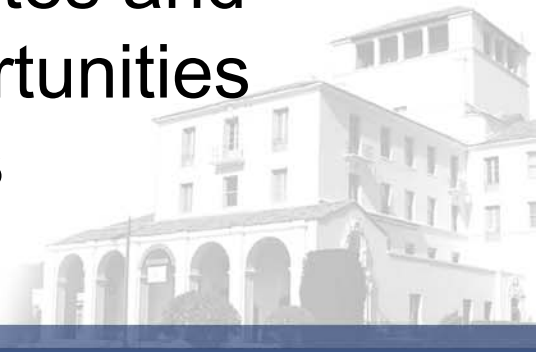
Overview

- Knowledge Management (KM) concepts and tools applied to improve Program Self Awareness
- Benefits Acquisition and RDT&E program managers and supports implementation of OA and CPM
- Sponsors
  - NPS Acquisition Research Program
  - NPS Distributed Information Systems Experimentation (DISE) Group
  - Briefed to DoD EA for Maritime Domain Awareness

Program Self Awareness

- The collective and integrated understanding of program attributes (system technology features, R&D activities, etc) and surrounding environment by program decision makers (PMs, system engineers, sponsors)
- Allows decision makers to recognize relationships among program attributes and seize collaboration and re-use opportunities to support cost effective acquisitions



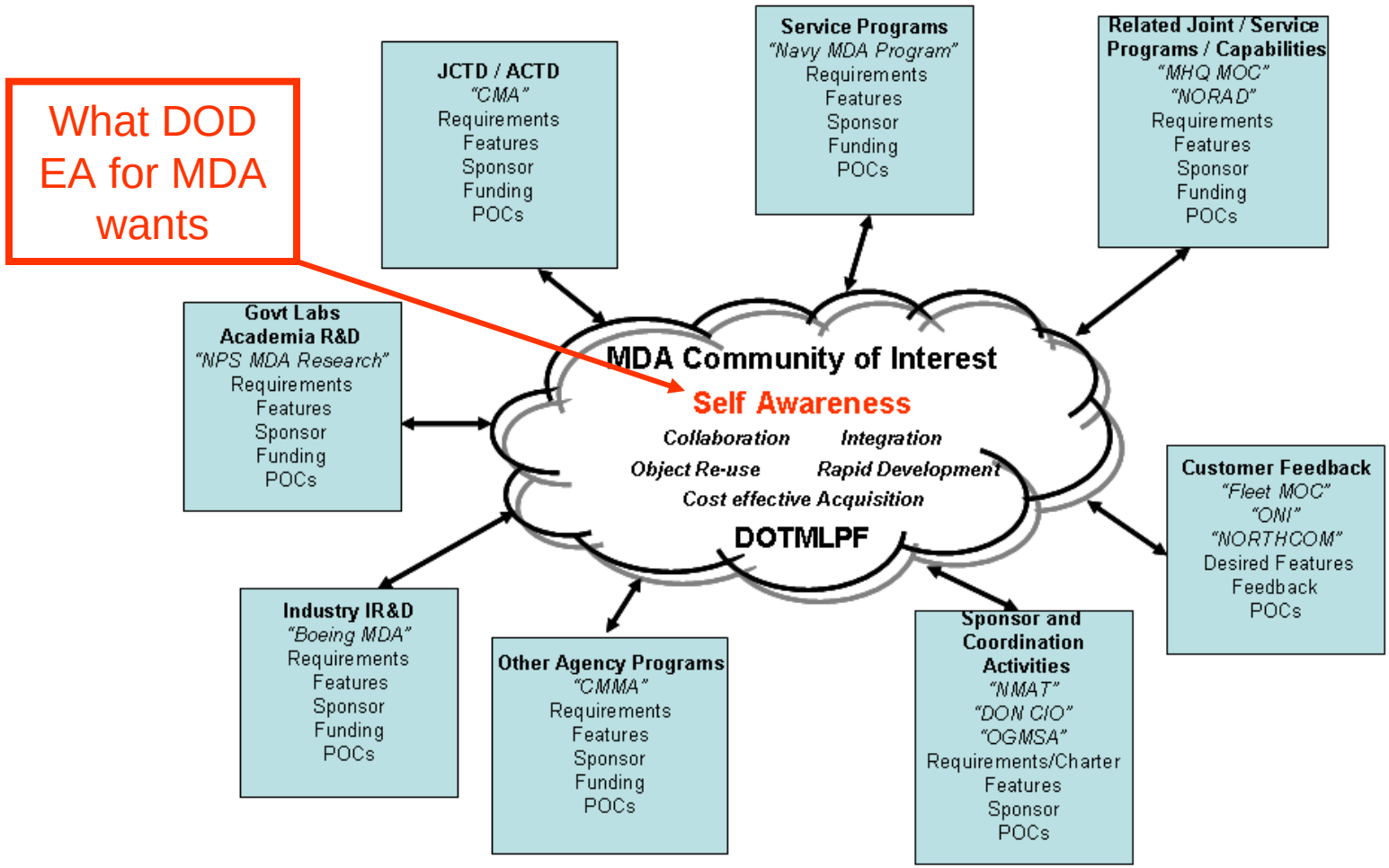
Self Awareness?

Ref: DAU, 2008, DoD 5000 Brief

Test Case

- Maritime Domain Awareness (MDA) Program
  - Environment is complex, many stakeholders, programs, processes, related activities
  - Self Awareness needed to coordinate and synchronize portfolio of activities and technologies
  - Coherent views needed to develop Self Awareness
  - Support informed decision making (resourcing RDT&E efforts, acquisition strategies, etc)
  - Improve developmental efficiency and speed

MDA Program Self Awareness

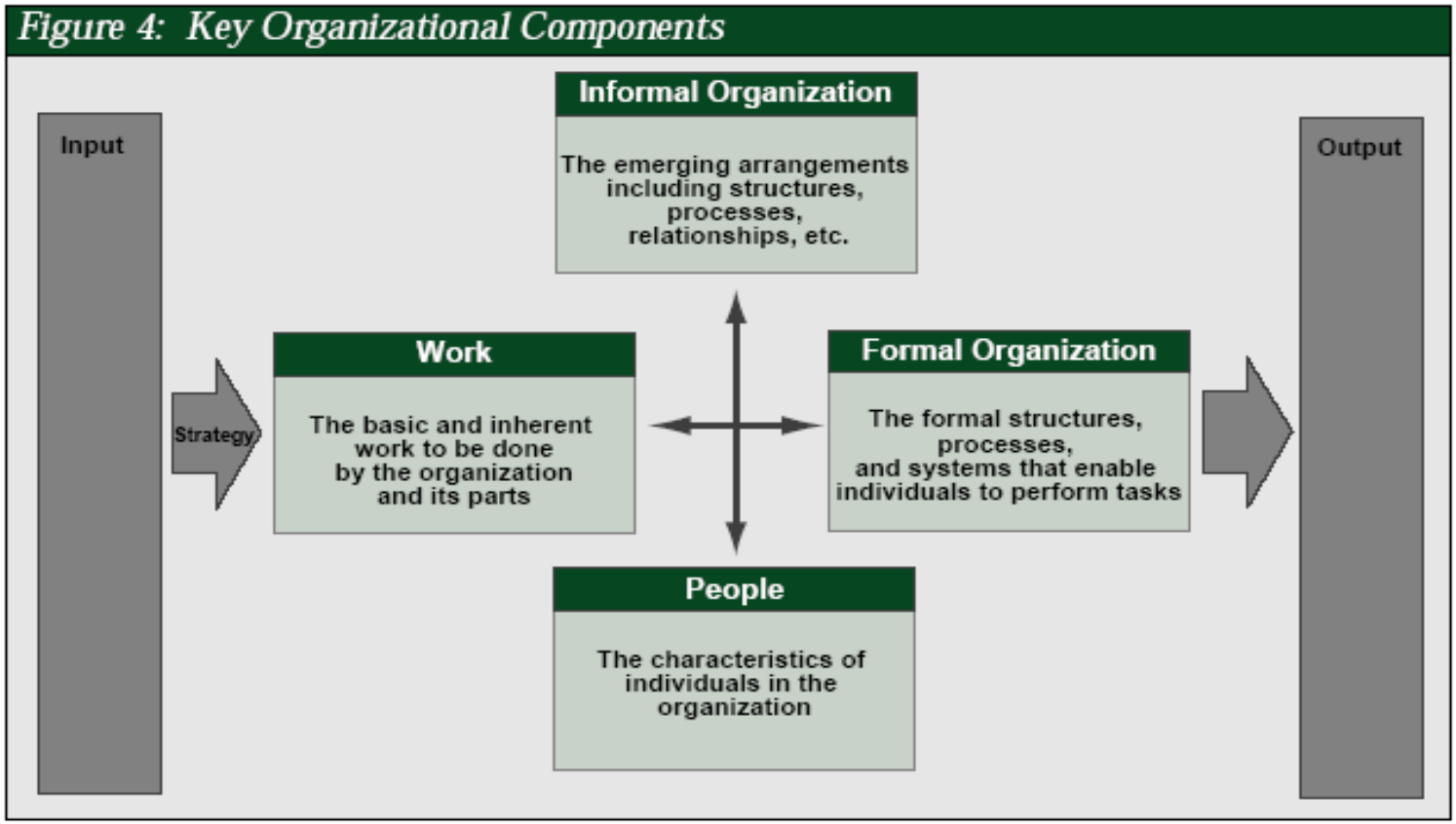


Methodology

- Apply Congruence Model to DoD Acquisition
  - Identify potential sources of poor “fit” which lead to duplication, lack of re-use, limited collaboration
- Collect structured and unstructured program data of select MDA technologies
- Apply KM tools (data and text mining) to prototype MDA Data Mart to identify “clusters” of MDA system features
- Analyze data and visualizations to identify system feature clusters which enable views of potential gaps and duplication of effort

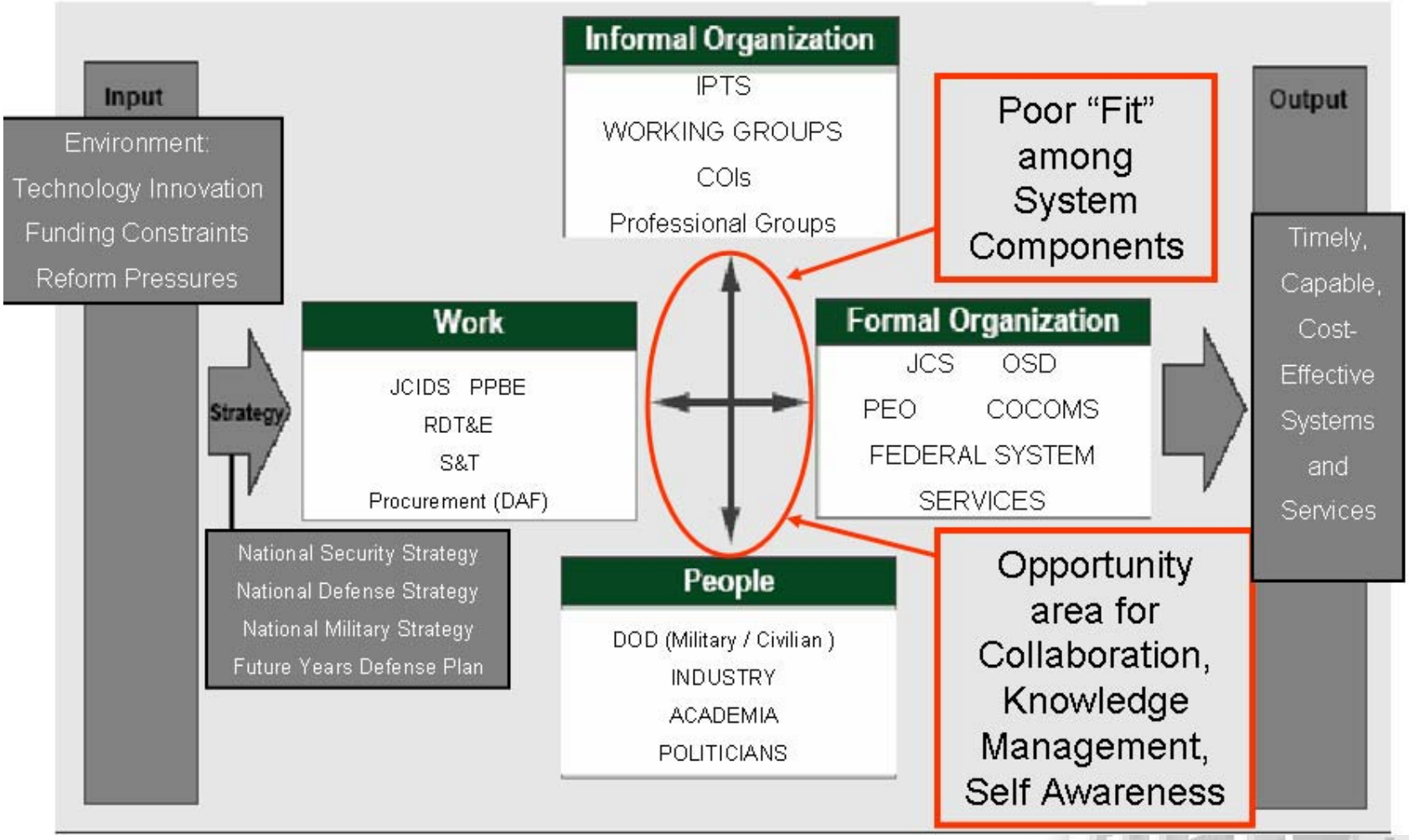
The Congruence Model

A Model To Understand Complex Acquisition Programs



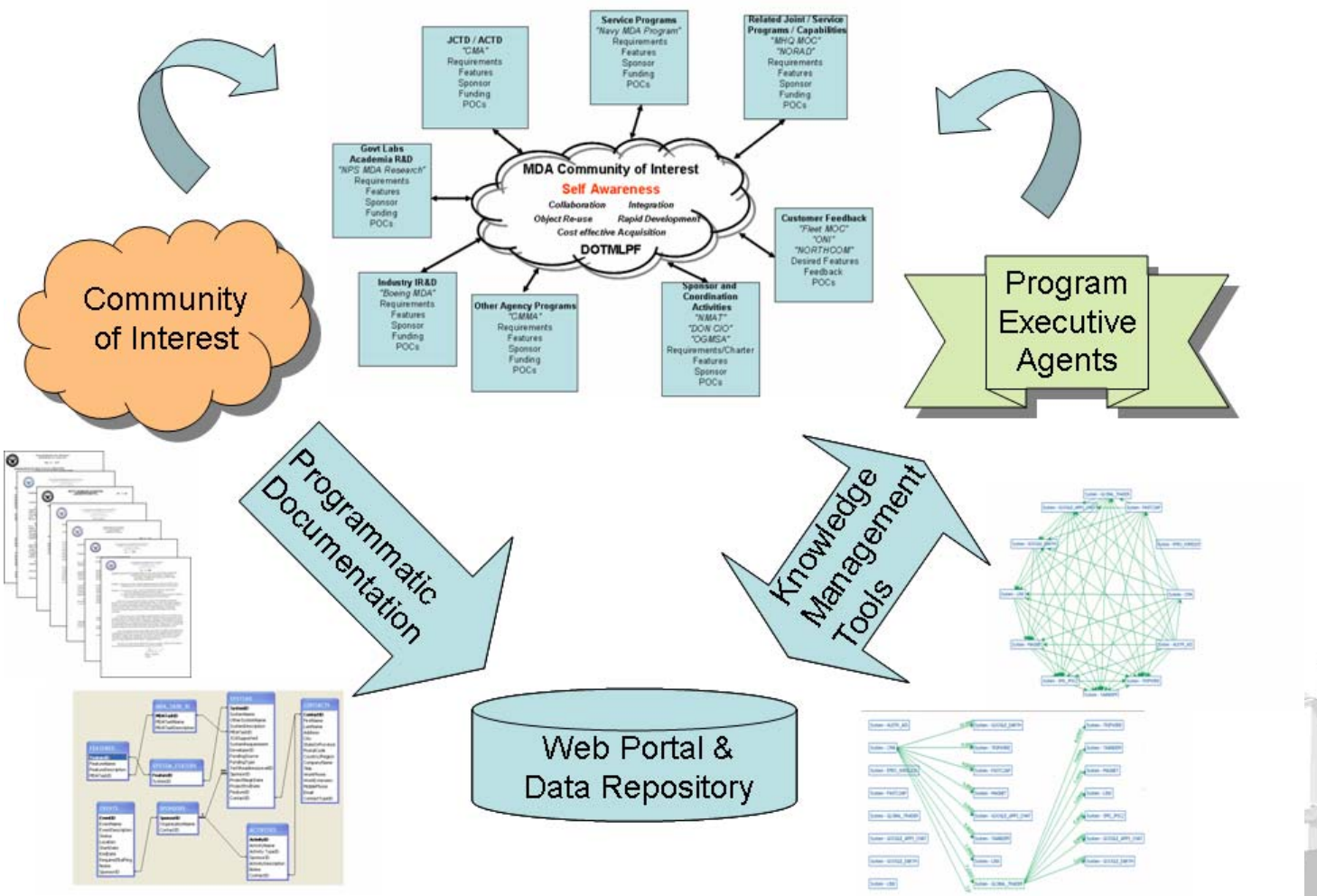
Ref: Mercer Delta, *The Congruence Model,* 1998

DOD Acquisition System



Ref: From Mercer Delta, *The Congruence Model,* 1998

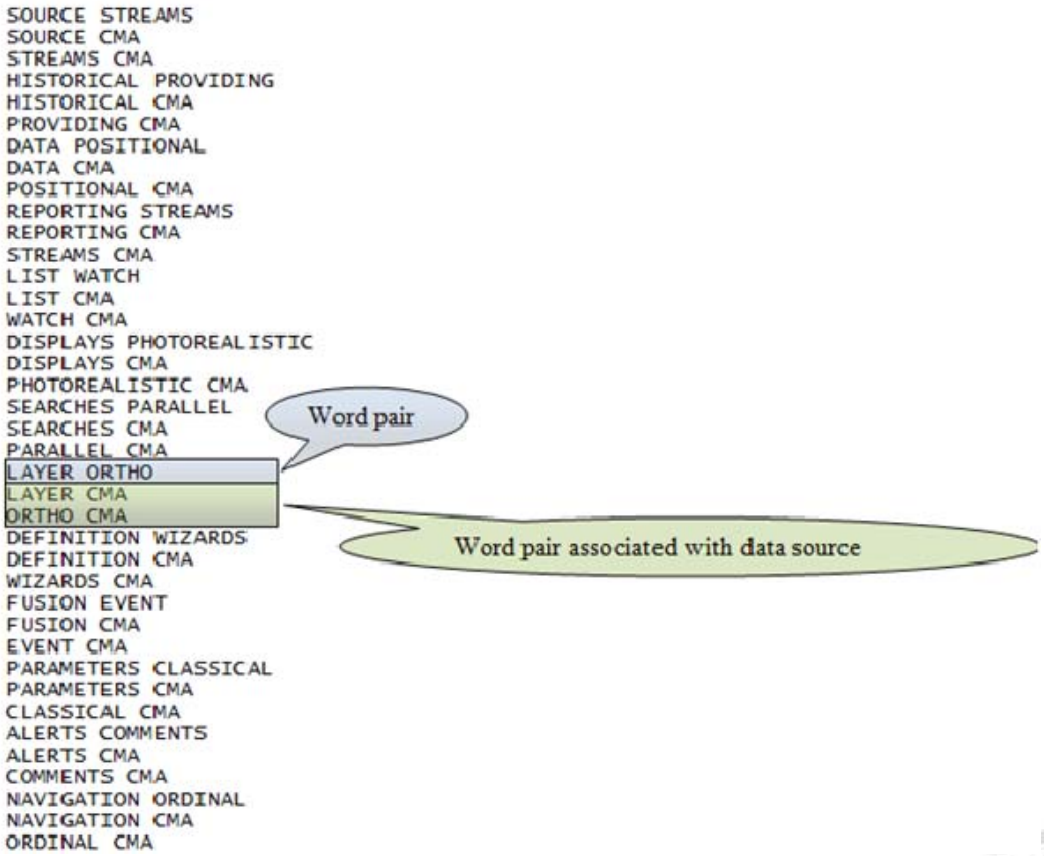
KM Methodology



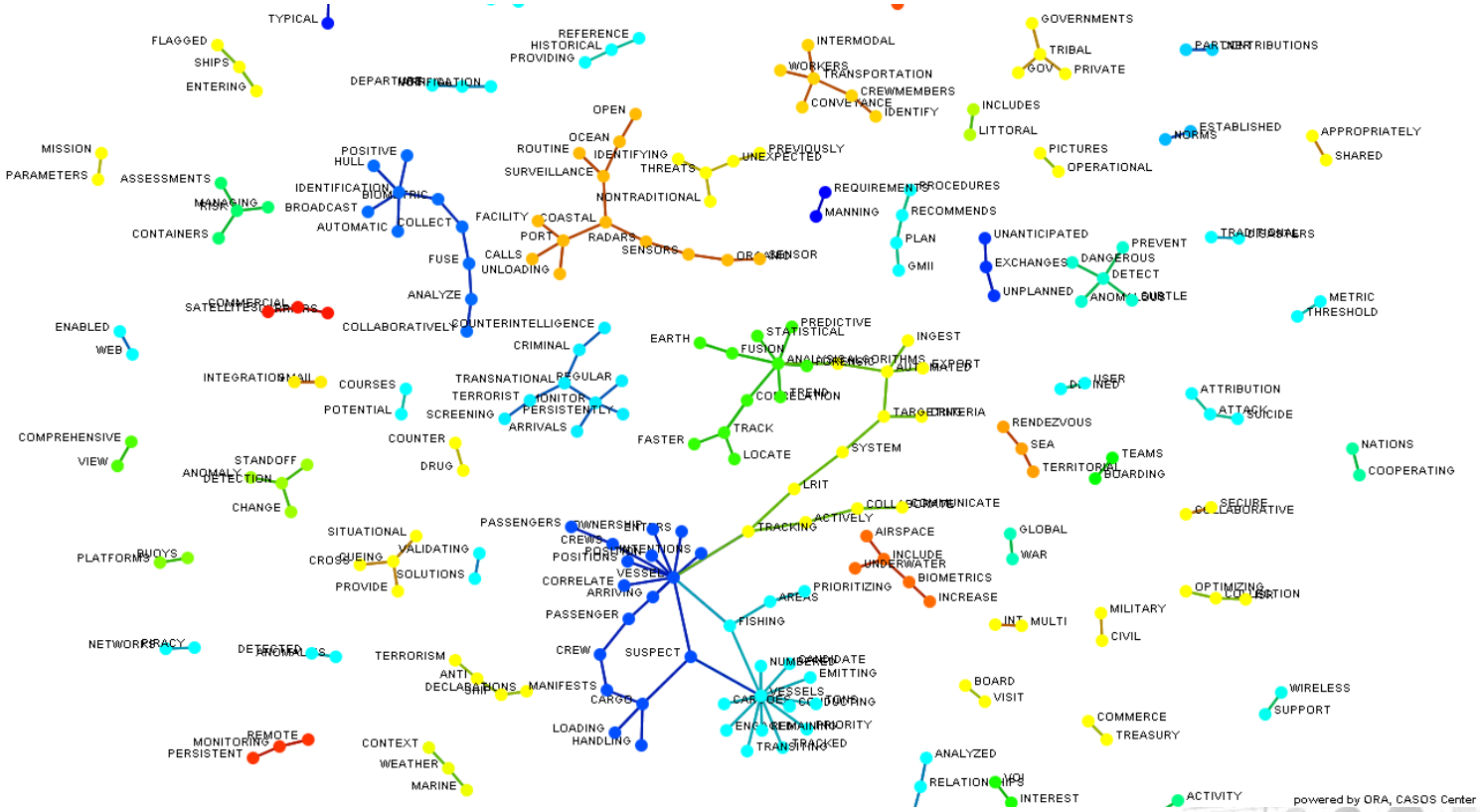
Data Analysis

- Apply KM concepts and support tools
  - Data repository
  - Cluster mining techniques
    - Group MDA technologies based on their features derived from structured and unstructured data
  - Visualization and analysis
- Leveraged NPS KM expertise to evaluate results
  - Team of experts
    - Program and KM expertise

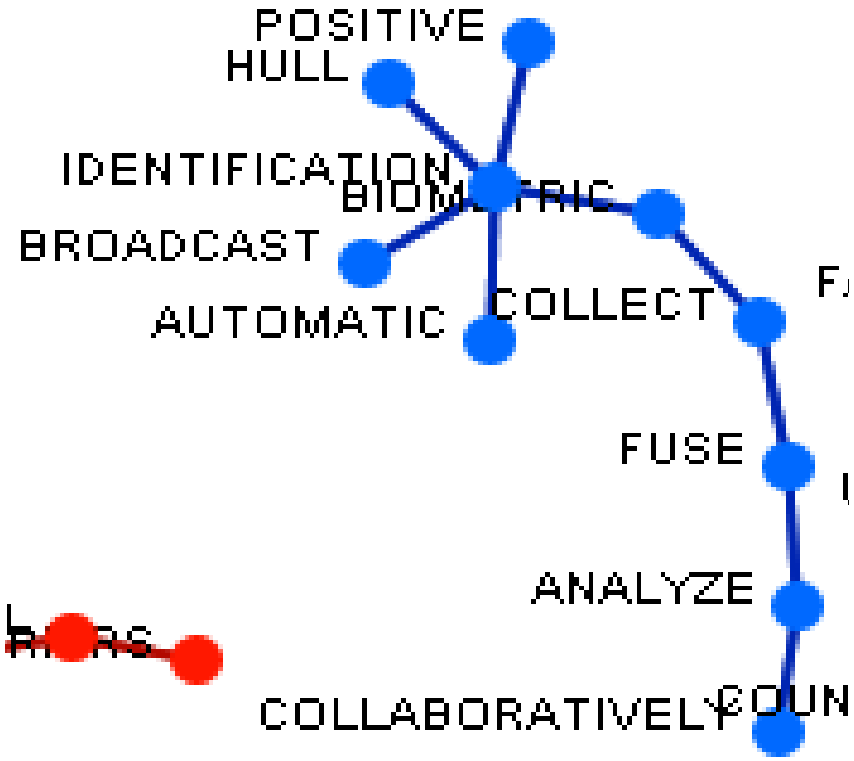
Text Mining Unstructured Data



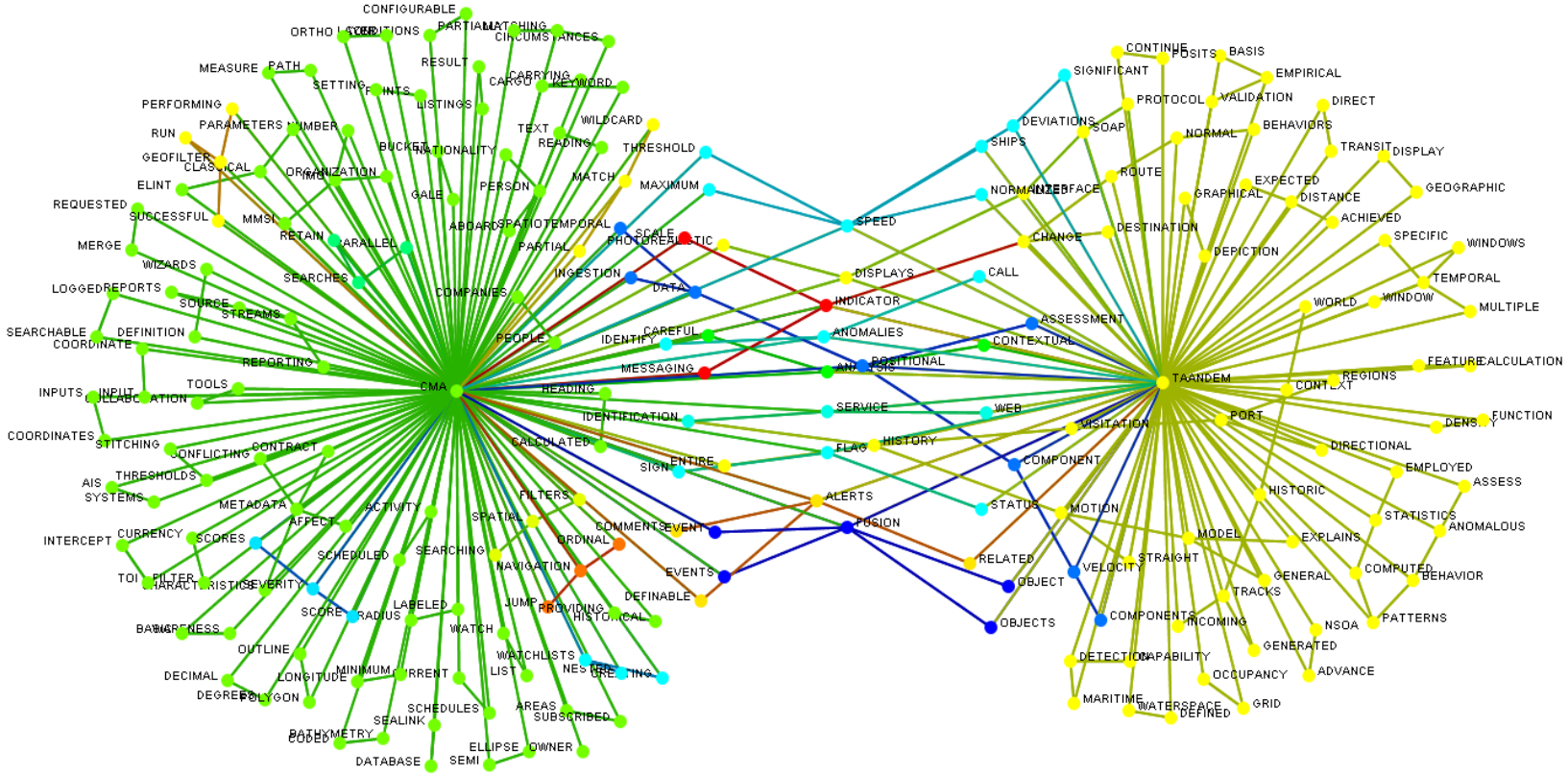
MDA Programmatic Feature Clusters



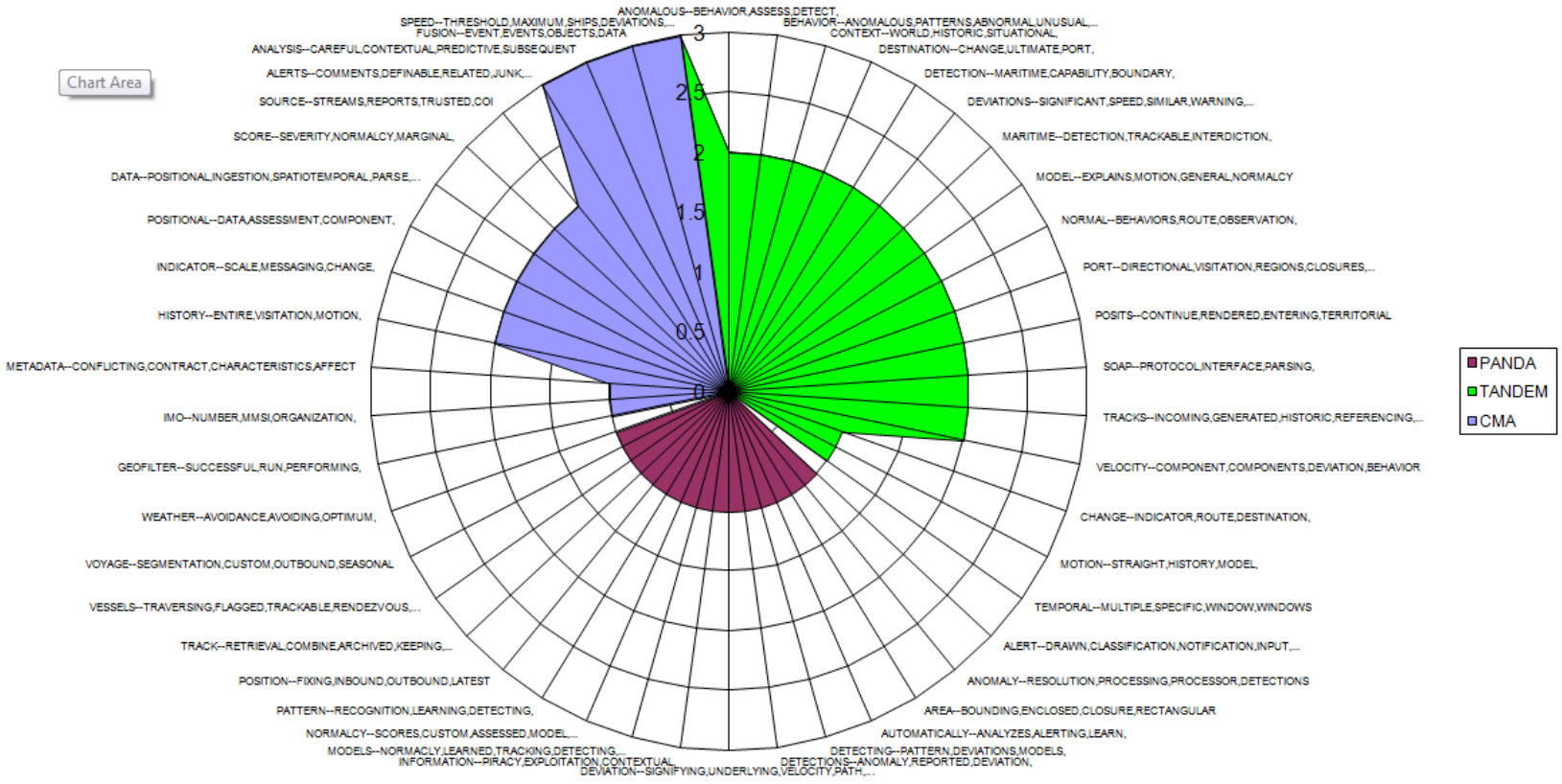
Feature Cluster



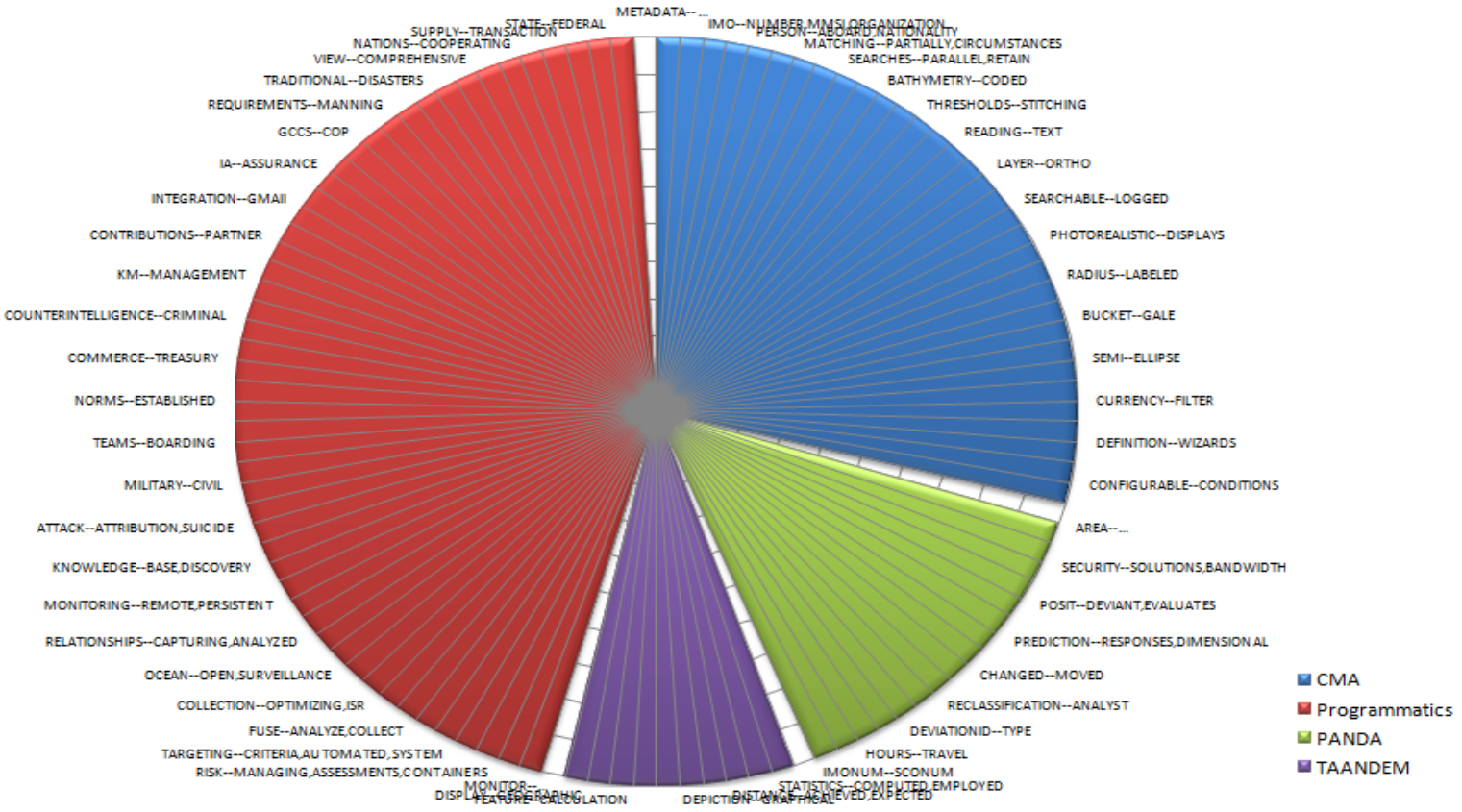
CMA and TAANDEM Shared Features



Shared Feature Cluster Analysis



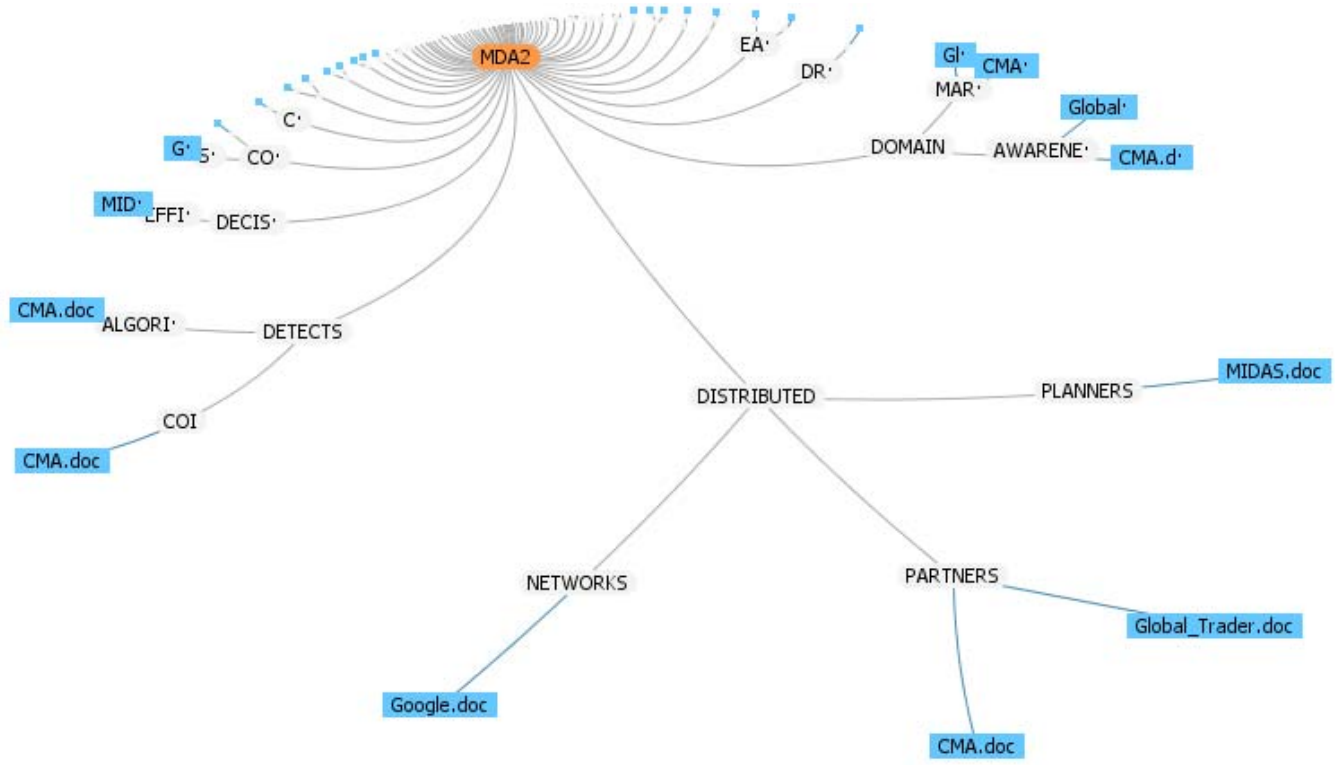
Feature Cluster Gap Analysis



Structured Data Analysis

- Many organizations have databases, and use queries and reports to extract and organize data for decision making
- Text mining can also be applied to structured data to highlight previously unknown relationships
- MDA Objective data from FIRE experimentation database
- Developed visualization of feature associations

Feature cluster relationships to MDA systems



Findings

- MDA Program is representative of complex DoD Acquisition Programs
  - Self Awareness needed but difficult to achieve
  - Technology not being leveraged to overcome information stovepipes and cultural barriers
- KM concepts and tools
  - Can improve Program Self Awareness – discovery of program relationships
  - May expose portfolio gaps and duplication and promote collaboration and component re-use
  - Team of KM and Program experts needed

Recommendations

- Acquisition reform efforts must invest in proven enterprise technologies (KM, collaboration tools)
- Develop a KM implementation strategy
  - Incremental, built on small successes
  - Implement @ program level as a test case
  - Champion(s) needed to drive change in system
- Conduct future research
  - Refine KM tools – drill down, visualization products
  - Applications – requirements development, traceability

Questions and Discussion

BACK-UP

Methodology

Observed Problem and Intuition	*Theoretical POD / Gap*	*Research Question*	*Data Source*
Duplication of effort, limited re-use and collaboration in DoD Acquisition Programs due to lack of Program Self Awareness	**Systems Theory and Congruence Model – a model to understand the acquisition environment and Program Self Awareness**	**How can Knowledge Management methods and tools be used to improve Program Self Awareness, collaboration and re-use in complex acquisition programs?**	**Case study of Navy MDA Program** **-Develop MDA Data Mart from structured and unstructured program data sources**
Improved DOD Acquisition Program efficiency and effectiveness	**Better understanding of DoD Acquisition System knowledge environment and potential for improved Program Self-awareness enabled through KM tools**	**- Collaboration complex and not efficient** **- Lack of Program Self Awareness due to complexity and culture** **- KM tools can be applied to improve MDA Program Self Awareness and decision making**	**- Mine Data Mart to derive system "feature" data and develop visualization tools to show relationships among system attributes** **- Identify duplication and opportunities for collaboration, re-use and efficiency**
Predicted Impact	***Contribution***	***Findings***	***Data Analysis***

Ref: From CIFE Horseshoe Research Method

Congruence Model

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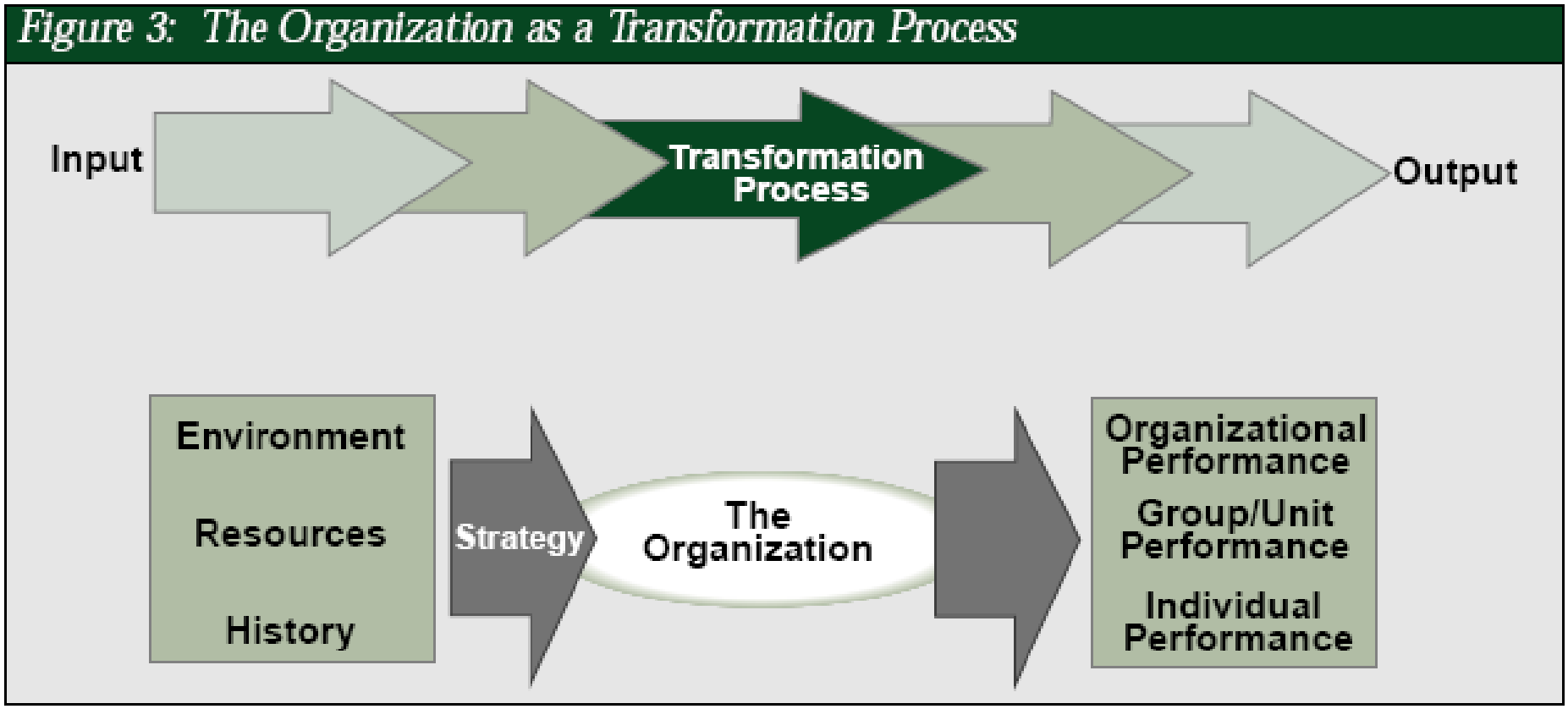

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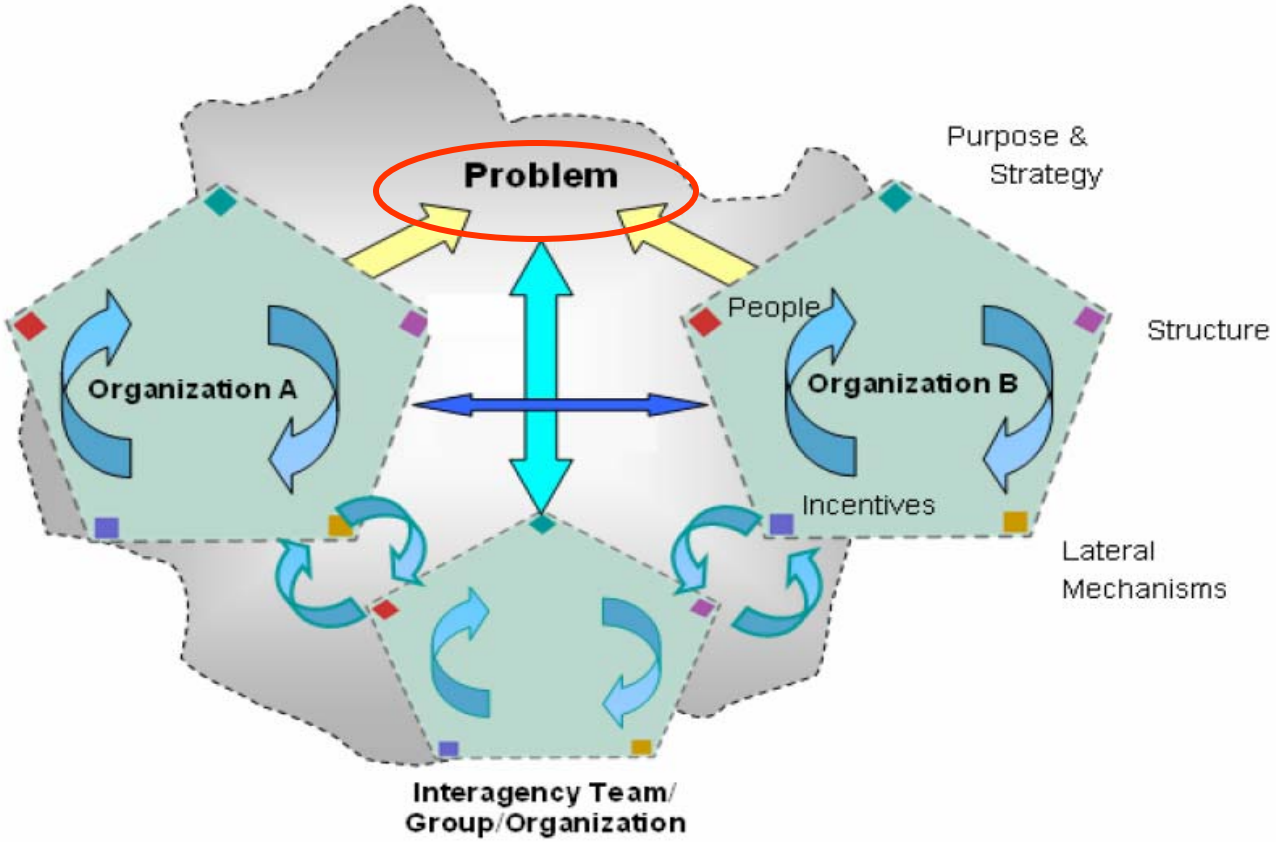
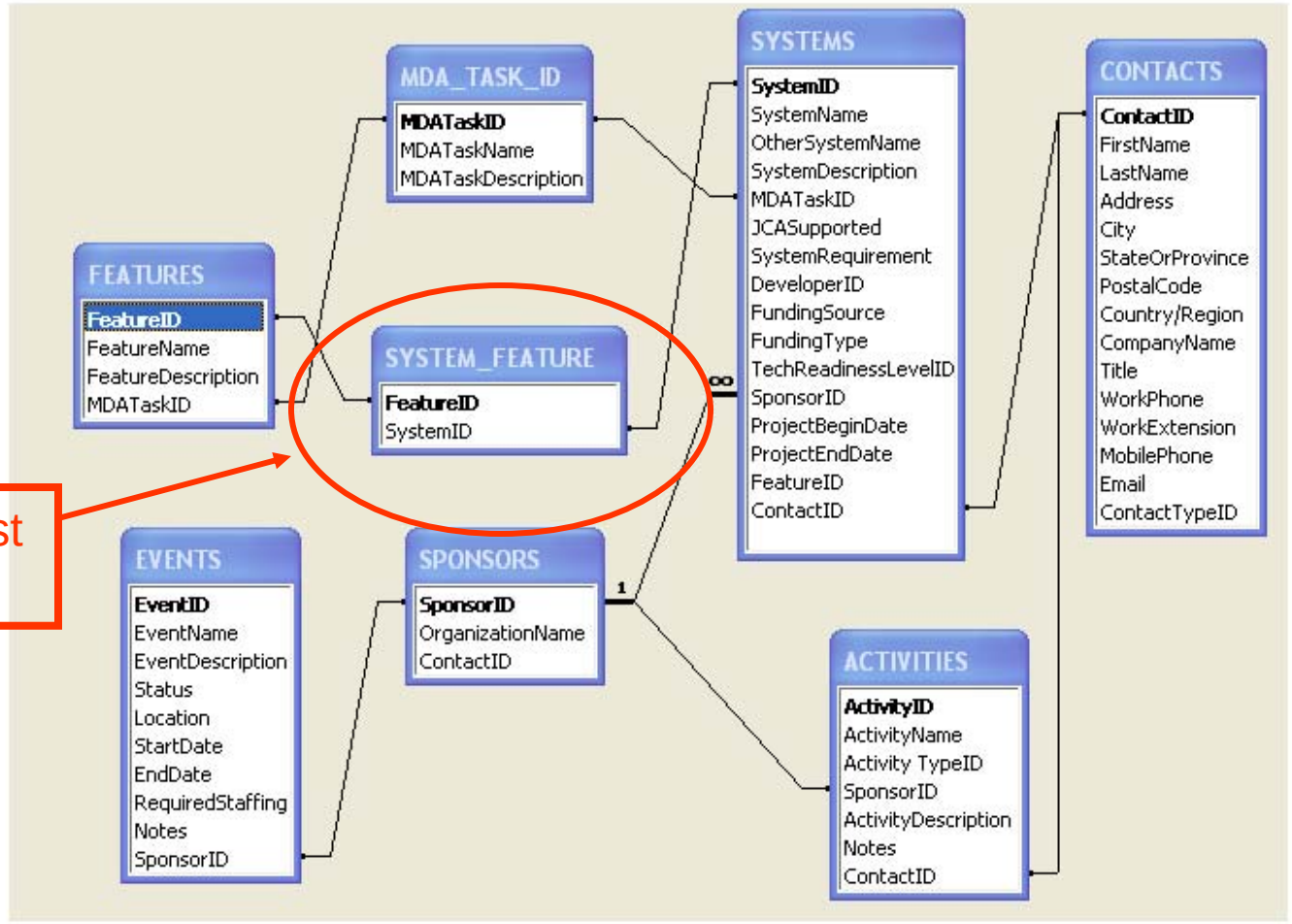
Collaborative Capacity



Ref: Figure 2 from Building Collaborative Capacity Paper (NPS ARP) - Lewin's "force field" analysis model (McShane & Van Glinow, 2005).

The Objective – Increased Collaboration to solve a common Problem

MDA Program Relations



Thesis Test Case

A Notional MDA Program Data Schema to support Self Awareness and Decision Making

Challenge of Collaboration

	DRIVING FORCES	RESTRAINING FORCES	DESIRED END RESULT
Organization design component	*"Success" factors that contribute to collaborative capacity*	*"Barriers" that inhibit collaborative capacity*	
Purpose & strategy	- "Felt need" to collaborate - Common goal or recognized interdependence - Adaptable to interests of other organizations	- Divergent goals - Focus on local organization over cross-agency (e.g., regional) concerns - Lack of goal clarity - Not adaptable to interests of other organizations	Collaborative capacity that lead to high performance
Structure	- Formalized coordination committee or liaison roles - Sufficient authority of participants	- Impeding rules or policies - Inadequate authority of participants - Inadequate resources - Lack of accountability - Lack of formal roles or procedures for managing collaboration	
Lateral mechanisms	- Social capital (i.e., interpersonal networks) - Effective communication and information exchange - Technical interoperability	- Lack of familiarity with other organizations - Inadequate communication and information sharing (distrust)	

Ref: Buliding Collaborative Capacity Paper (NPS ARP) - Lewin's "force field" analysis model (McShane & Van Glinow, 2005).

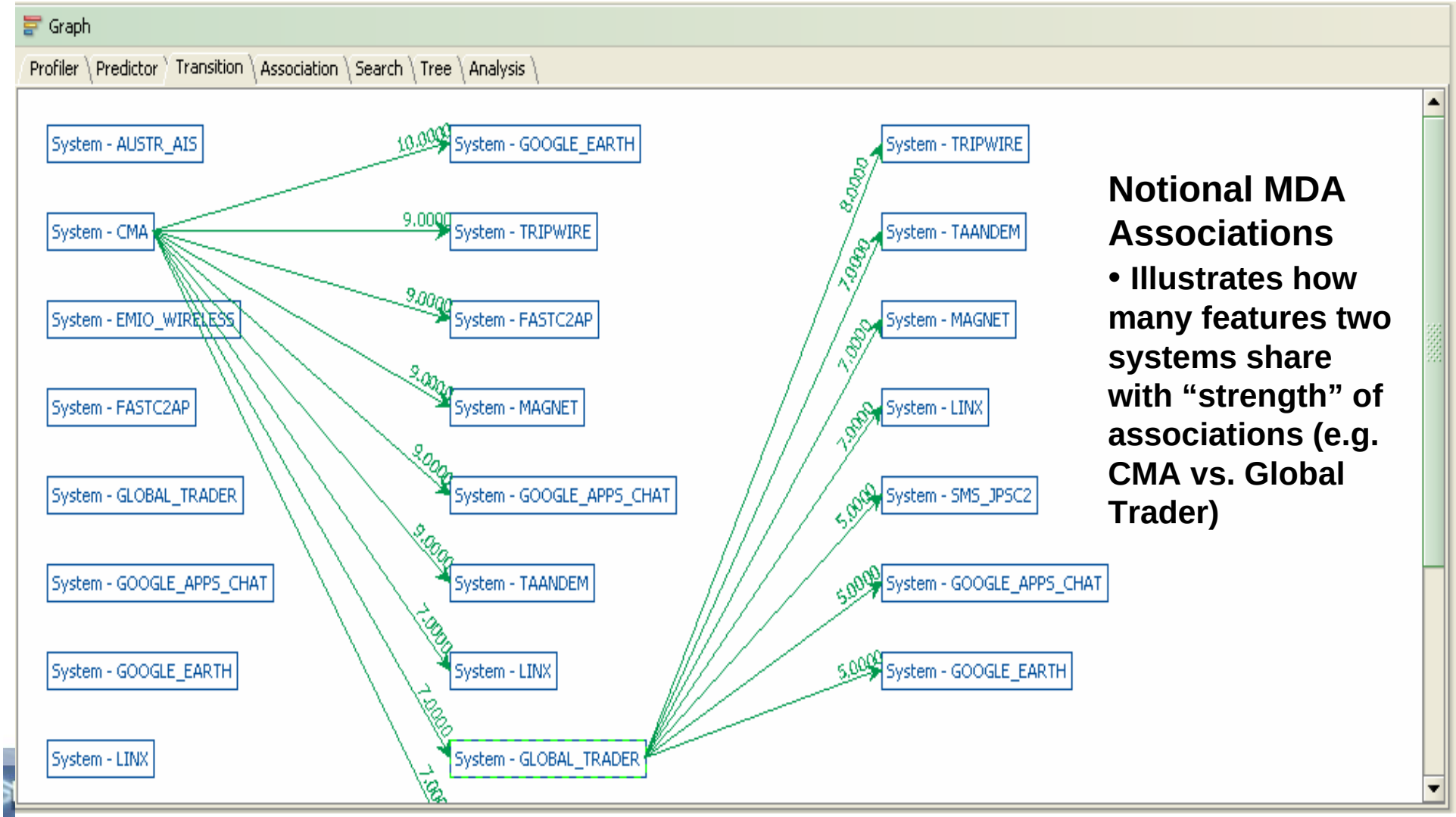
Barriers to Re-use

Force Field Analysis – Services Reuse

Driving Forces	Restraining Forces
Net-Centric transformation strategy	No acquisition model for shared-services, unclear business incentives & ROI,
Emerging industry standards	Changing Standards and technologies
Need for accelerated capability in field	No easy process for funding, prioritizing and testing modifications to operational systems
DoD Net-centric Directives, Instructions and Strategies	Inadequate trust of services for availability, reliability and supportability
Certification & accreditation reuse	Security concerns and lack of mechanisms for certification and accreditation
The promise of service-oriented and net-centric architectures	Service doesn't completely meet users' needs, different semantics across communities
Reduced development time and cost	Uncertain load balancing, support and governance
Reduced maintenance cost	Vendor incompatibility
Easier exchange of data	No mechanism to discover available services and data

Ref:" Dave Chesebrough."The Role of Architecture in Moving DoD to a Net-Centric Environment", *Software TechNews Dec 06*

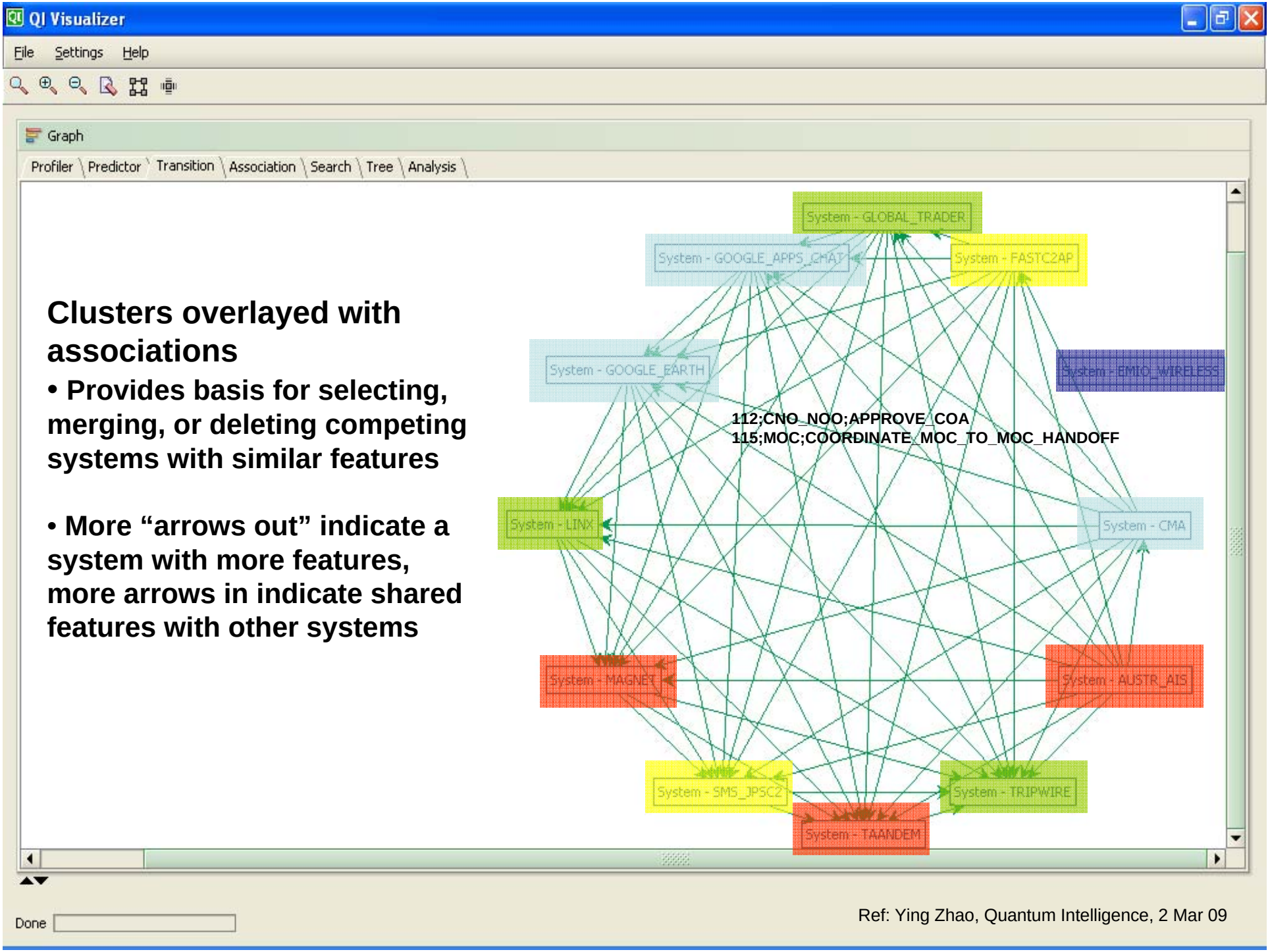
Cluster Visualization



Notional MDA Associations

- **Illustrates how many features two systems share with "strength" of associations (e.g. CMA vs. Global Trader)**

Ref: Ying Zhao, Quantum Intelligence, 2 Mar 09



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